

CLAIMS

What is claimed is:

1. A device for driving an attachment element into a work piece comprising:
a first drive element for driving a plunger in a first direction away from an attachment element to be driven, and said plunger storing energy in an energy storage mechanism when moved in said first direction;
a second drive element to drive said plunger in a second direction opposed to said first direction, and release stored energy stored in said force storage mechanism in combination with a power force from said second drive element to said plunger when moved in said second direction to drive an attachment element.
2. A device as set forth in claim 1, wherein said drive element for moving said plunger in said first direction and in said second direction are the same drive element, said drive element being an electric coil.
3. A device as set forth in claim 2, wherein said coil tends to center said plunger within said coil, and said plunger first being positioned spaced toward the attachment element from a centered position, said plunger being pulled into said coil in said first direction and power to said coil being stopped before said plunger reaches a centered position, momentum carrying said plunger beyond said centered position; and against said force storage mechanism to transfer force to said force storage mechanism.

4. A device as set forth in claim 3, wherein said control and said force storage mechanism are designed such that said plunger stores energy in said force storage mechanism, and said second drive force is then initiated.
5. A device as set forth in claim 4, wherein said force storage mechanism is a coil spring.
6. A device as set forth in claim 2, wherein said control drives said plunger in said first and second directions to correspond with peaks in a power curve.
7. A device as set forth in claim 2, wherein said control receives a signal from a position sensor when said plunger reaches a rearwardly spaced position, and drives said plunger in said second direction once said position sensor has identified said plunger as being in said rearwardly spaced position.
8. A device as set forth in claim 2, wherein a mechanical lock catches and hold said plunger after said plunger has been driven in said first direction.
9. A device as set forth in claim 8, wherein said mechanical lock includes a spring biased element caught within a groove in said plunger.

10. A method of operating a device and driving an attachment element into a work piece comprising the steps of:

(1) providing an electric coil for driving a plunger in opposed directions, and providing an energy storage mechanism beyond said coil in a first direction, and positioning elements to be driven into a work piece beyond said coil in a second direction;

(2) powering said coil to move said plunger in said first direction;

(3) causing said plunger to contact said energy storage mechanism and transfer energy to said energy storage mechanism;

(4) driving said plunger in said second direction such that a force from said coil on said plunger is combined with a release of energy from said energy storage mechanism; and

(5) bringing said plunger into contact with said attachment element, and driving said attachment element into a work piece.

11. A method as set forth in claim 10, wherein said power to said coil is stopped while said plunger is moving in said first direction before said plunger moves beyond a center position within said coil.

12. A method as set forth in claim 11, wherein power to said coil is stopped while said plunger is being driven in said second direction before said plunger reaches a centered position within said coil when moving in said second direction.

13. A method as set forth in claim 10, wherein said energy storage mechanism is a coil spring, that is compressed by said plunger when said plunger is driven in said first direction.

14. A method as set forth in claim 10, wherein a control for said coil is designed to drive said coil in said first and second directions as a power curve to said coil approaches a peak, and said spring and said control being designed such that a peak for driving said coil in said second direction is reached after said plunger has compressed said spring.

15. A method as set forth in claim 10, wherein a control for said coil is provided with position feedback of said plunger, said coil firing said plunger to move in said second direction once said plunger reaches a predetermined position moving in said first direction.

16. A method as set forth in claim 15, wherein said control further stores energy for driving said plunger in said second direction in a capacitor, and said energy is released once said position sensor indicates said plunger has reached a predetermined position.

17. A power nailer for driving a nail into a work piece comprising:

a plunger having a blade at a forward end, said plunger being guided within guides adjacent one end, and said blade being brought into contact with a nail received within said power nailing device;

a coil positioned to drive said plunger in a first and second direction;

a spring on an opposed side of said coil from said nail; and

a coil for driving said plunger within said coil in a first direction, and away from said nail, said plunger moving to compress said spring, and transfer energy from said plunger to be stored in said spring, and said control then being operable to fire said coil to drive said plunger in said second direction such that a force on said plunger when moving in said second direction includes a force from said coil, and a force previously stored in said spring, said plunger then being brought into contact with said nail, driving said nail into a work piece.

18. A method of operating a device and driving an attachment element into a work piece comprising the steps of:

(1) pulling a plunger in a first direction away from an attachment element to be driven, and storing at least a portion of the force of movement of said plunger in said first direction; and

(2) driving said plunger in a second opposed direction with a drive force, and releasing said stored energy to be combined with said drive force as said plunger moves toward an attachment element to be driven.

19. A method as set forth in claim 18, wherein said energy storage mechanism is a spring, and an electric coil pulls said plunger in both said first and second directions.

20. A method as set forth in claim 18, wherein a single drive element drives said plunger in both said first and second directions.